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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/669,644
Filing Date: September 25, 2003
Appellant(s): SAWAI, MASAYOSHI

Chidambaram S. Iyer
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11/26/07 appealing from the Office action mailed 1/10/07.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is incorrect.

The amendment after final rejection filed on 4/4/07 has been entered. The amendment did not contain amendments to the pending claims after issuance of the Final Office Action dated 1/10/07.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

9,961,683	Kodama et al	11-2005

Neul et al "A Modeling Approach to Include Mechanical Microsystem Components into the System Simulation", Proceedings of Design, Automation and Test in Europe, February 23-26 1998, pages 510-517

Peterson et al "Application of Dynamic System Identification to Timber Beams", Journal of Structural Engineering, April 2001, pages 418-425

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kodama et al (US Patent 6,961,683) in view of Neul et al ("A Modeling Approach to Include Mechanical Microsystem Components into the System Simulation", Proceedings of Design, Automation and Test in Europe, pages 510-517, 23-26 February, 1998) and Peterson et al ("Application of Dynamic System Identification to Timber Beams", Journal of Structural Engineering, April 2001, pages 418-425).

As to Claims 1-8, Kodama et al teaches: a method of assisting a wiring design of a wiring structure comprising the steps of: (Claims 1, 5, 7, 8) regarding the wiring structure constituted by a plurality of pieces of line streak members as an elastic body having a circular section, the elastic body having a plurality of beam elements coupled with each other (Figure 1, column 5, lines 46-48; Figure 5, column 7, lines 16-25; Figure 8, column 13, lines 10-16); applying information concerning a shape characteristic (column 10, lines 29, 48-50), and a constraining condition of the wiring structure as a predetermined condition, wherein the constraining condition is defined by coordinates of respective apexes of the plurality of beam elements and degrees of freedom at the respective apexes (column 10, lines 30-32, 38-40; column 11, lines 16-22); calculating a predicted shape of a displaced wiring structure such that the predetermined condition is satisfied (column 11, lines 44-63); outputting the calculated predicted shape (Figure 7, element S7); and (claim 3) wherein the wiring structure is a wire harness wired to a vehicle (column 1, lines 17-27).

Kodama et al does not expressly teach (claim 1) a linearity of the plurality of beam elements being maintained; (claim 1) the finite element method; (claim 1)

calculating a characteristic value with respect to vibration for the calculated predicted shape and outputting the calculated characteristic value, (claims 2, 5, 6, 7, 8) wherein the characteristic value includes at least one of a natural frequency and a natural vibration mode, (claim 3) the shape characteristic is defined by a sectional area and a length of the beam element of the wiring structure; (claim 1, 3) a material characteristic wherein the material characteristic is defined by a moment of inertia, a polar moment of inertia, a density and a longitudinal modulus of elasticity and a transverse modulus of elasticity of the beam element; (claim 4) analyzing a characteristic value with respect to vibration for the predicted shape and outputting the results of the analysis.

Neul et al teaches the analysis of mechanical components based on finite element analysis using spatial beams (page 511, Section 2, paragraph 1; page 512, column 1, lines 4-17) that gives an accurate description of the static and dynamic behavior of linear spatial beams as well as more complex configurations constructed from those beams (Conclusion); wherein linearity is maintained among the beams (page 514, column 2, last paragraph-page 515, column 1, lines 1-3); wherein the properties of a beam element is determined by properties of its material characteristics including density, moment of inertia, polar moment of inertia and modulus of elasticity, and shape characteristics including length and cross sectional area, moment of inertia and polar moment of inertia, wherein the displacements contained in x are denoted by w and the torsions by φ (page 512, column 1, lines 20-30). Further, Neul et al teaches verifying the dynamic properties of the models by calculating the natural frequencies of a beam, the vibrations in a beam and determining the shapes vibration in the beam (page 515).

Peterson et al teaches a technique using an experimental modal analysis and a damage localization algorithm of a structure that can identify the location of even small magnitudes of simulated damage within a beam model (Conclusions, sentences 1-2).

Peterson et al teaches calculating a characteristic value with respect to vibration for the calculated predicted shape and outputting the calculated characteristic value, wherein the characteristic value includes at least one of a natural frequency and a natural vibration mode, analyzing a characteristic value with respect to vibration for the predicted shape and outputting the results of the analysis (page 422, column 2, lines 3-17) wherein the natural frequencies and mode shapes are determined (page 419, column 1, paragraph 4, first sentence; page 419, column 1, paragraph 5, last sentence; page 419, column 1, paragraph 6-column 2, lines 1-5); finite element analysis used to calculate modal parameters; and material characteristics including a longitudinal modulus of elasticity and a transverse modulus of elasticity of the beam element (page 421-422, "Analytical Verification of Damage Localization Algorithm", paragraph 1). Kodama et al, Neul et al and Peterson et al are analogous art since they are directed to the modeling of a mechanical component through the use of a beam model.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of assisting a wiring design of a wiring structure as taught by Kodama et al to include finite element analysis, the maintenance of linearity, the material characteristics, shape characteristics, and the calculation of natural frequencies and vibrations in a beam as taught by Neul et al since Neul et al teaches the analysis of mechanical components that gives an accurate description of

the static and dynamic behavior of linear spatial beams as well as more complex configurations constructed from those beams (Conclusion).

Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of assisting a wiring design of a wiring structure as taught by Kodama et al to further include the material characteristics, the calculation and output of a characteristic value including a natural frequency and natural vibration mode as taught by Peterson et al since Peterson et al teaches a technique using experimental modal analysis and a damage localization algorithm of a structure that can identify the location of even small magnitudes of simulated damage within a beam model (Conclusions, sentences 1-2).

(10) Response to Argument

As to claim 1, Appellant argues that claim 1 requires that certain “assumptions” be made "prior to modeling the wiring structure", one of these “assumptions” being that the “linearity between the plurality of mean elements is maintained” (page 11).

The Examiner would like to point to the limitation of claim 1 that recites “regarding the wiring structure constituted by a plurality of pieces of line streak members as an elastic body having a circular section, the elastic body having a plurality of beam elements coupled with each other, a linearity of the plurality of beam elements being maintained". It is the Examiner's position that this limitation is directed to how the wiring structure is modeled, that is, the wiring structure is modeled (or, "regarded") by the

"plurality of pieces of line streak members as an elastic body having a circular cross section...", wherein the "elastic body has a plurality of beams coupled together wherein the linearity of the plurality of beam elements is maintained". The Examiner concludes that there is no indication of any "assumptions" made "prior to modeling".

Appellant argues that "the above assumptions required by claim 1 are not suggested by the combination of Kodama, Neul and Peterson", specifically directed to the assumption that the linearity between the plurality of beam elements is maintained, and states that the Patent Office admits that Kodama fails to teach this feature of claim 1 (page 11).

Before discussing this above argument in reference to the cited art, the Examiner would like to discuss this particular limitation, that is, "a linearity of the plurality of beam elements being maintained". The Examiner contends that one of ordinary skill in the art would interpret "linear" to be directed to something resembling a straight line, and therefore, would interpret the limitation of the "elastic body having a plurality of beam elements coupled with each other, a linearity of the plurality of beam elements being maintained" as a body, or model, made up of *straight beam elements* coupled together. It was this interpretation of "linearity" that lead the Examiner to conclude that Kodama does not expressly disclose "a linearity of beam elements being maintained". The Examiner then relied upon the teachings of Neul, wherein Neul shows the modeling of a mechanical device using beam elements for linear systems, wherein the linearity of the beam elements are maintained (page 514, column 4, last paragraph-page 515, column

1, lines 1-3, "we are dealing with linear systems") and as further shown (Figure 2, "Modeling Using Spatial Beam Elements"; section 2, paragraph 1, lines 8-9; Figure 4, wherein the beam elements are made up of straight lines). The Examiner concludes that the Neul reference discloses the modeling of a structure as a plurality of beam elements coupled together, *wherein the linearity of beam elements is maintained*, and therefore, concludes that the rejection set forth is proper.

Further, the Examiner would like to point out that in reviewing Appellant's arguments set forth as to "regarding the wiring structure...a linearity of the plurality of beam elements being maintained...", Appellant points to Figure 1 and page 12, lines 14-22 of the application (see page 6). Figure 1 "is a view showing an outline of the total shape of the wire harness constituting the object of the design according to the embodiment of the invention". The Examiner concludes that the "beam elements" shown in Figure 1 are not "linear", that is, they are not straight lines, as one of ordinary skill in the art would understand a linear beam element to be. Further, Figures 3c shows the wire harness "expressed" by beam elements and node points. Again, the beam elements of Figure 3c do not show that the beam elements (C1-C7) are linear. However, the Examiner concludes that based upon how Appellant sets forth this "linearity" of the beam elements that is maintained, that is, as shown in Figure 1 and further in Figure 3c, the Kodama reference does in fact disclose this limitation, as defined by Appellant in the specification, since Figures 1 and 8 of Kodama, show structures that are structurally equivalent to Appellant's Figures 1 and 3c.

Appellant argues that the combined teachings of Neul and Kodama do not teach or suggest the assumption that linearity between the plurality of beam elements is maintained (page 12).

It is the Examiner's position that the combined teachings of Neul and Kodama "assume" that the linearity of beam elements is maintained in the "regarding" of a wiring structure as an elastic body having a plurality of beam elements coupled to each other, as taught in Neul based upon both the interpretation of "linear" beam elements as would be concluded by one of ordinary skill in the art (see response to arguments above), and as taught in Kodama based upon the showings of what Appellant sets forth to be "linear" in the application (see response to arguments above).

Appellant argues, “Linearity in terms of claim 1 is a mathematical concept of there is no reason or rationale for including a requirement of linearity in the calculations of Kodama for determining flexural rigidity and the shape of a wire harness" (page 12).

It is the Examiner's position that there is nothing set forth in claim1 that requires that linearity be a "mathematical concept". Further, in terms of how linearity is set forth in the application and Appellant's arguments, linearity is taught in Kodama (see response to arguments above).

Appellant argues that the combination of Kodama, Neul and Peterson do not teach or even suggest that all three predetermined characteristics of a shape

characteristic, a material characteristic and a constraining condition must be satisfied by the calculated shape of the wiring structure (page 12).

The Examiner points to the "basic shape calculation process" in Kodama wherein the process includes the input of shape characteristics (column 10, line 29 and lines 48-50, “thickness”, “length”) and constraining conditions (column 10, lines 30-32 and 38-40; column 11, lines 16-22). Neul et al teaches the modeling of the static and dynamic behavior of linear spatial beams (Conclusion) wherein the material characteristics determine the properties of the beam elements (page 512, column 1, lines 20-30). Peterson further teaches modeling a mechanical structure with beam elements wherein finite element analysis is used to calculate material characteristics of a beam element (page 421-422, "Analytical Verification of Damage Localization Algorithm", paragraph 1). Because Kodama teaches inputting shape characteristics and constraining conditions into a process to calculate the shape of a wiring structure, and since Neul and Peterson are both directed to modeling a mechanical structure with beam elements wherein material characteristics determine the properties of the beam elements, the Examiner concludes that the combinations of the teachings of Kodama, Neul and Peterson teach or suggest that predetermined characteristics of shape characteristics, material characteristics and constraining conditions must be satisfied in calculating the shape of a wiring structure, wherein the wiring structure is modeled as a plurality of beam elements.

Appellant argues that “calculating a characteristic value with respect to vibration for the calculated predicted shape” is not taught by the combination of Kodama, Neul and Peterson (page 13).

The Examiner concludes that the combination of Kodama, Neul and Peterson teaches or suggests "calculating a characteristic value with respect to vibration for the calculated predicted shape", wherein Peterson et al teaches identifying the locations of simulated damage within a beam model using an experimental modal analysis and damage location algorithm (Conclusions, sentences 1-2) wherein a characteristic value with respect to vibration for the predicted shape is calculated and output (page 422, column 2, lines 3-17), as recited in the final Office Action.

Appellant argues that the model generated with the modeling approach in Neul is not a calculated shape of the beam or a calculated shape of a wiring harness (page 13).

The Examiner concludes that the teachings of Kodama, not Neul, are relied upon to show the calculation of a shape of a wiring structure.

Appellant argues that Peterson does not suggest obtaining the natural frequencies for a calculated shape of a wiring harness (page 13).

The Examiner concludes that the teachings of Kodama are relied upon to show calculating the shape of a wiring harness. The teachings of Peterson are relied upon to show obtaining the natural frequencies for a mechanical structure modeled using beam

elements. The teachings of Peterson alone are not relied upon to show obtaining the natural frequencies for a calculated shape of a wiring harness.

Appellant argues that there would be no reason or rationale to modify Kodama to include a feature of calculating a characteristic value with respect to vibration for Kodama's calculated shape and any such contention will be the result of impermissible hindsight (page 14).

The Examiner set forth that Kodama, Neul and Peterson are analogous art since they are directed to the modeling of a mechanical component through the use of a beam model. Further, Examiner set forth a statement of motivation to combine the teachings of Kodama and Peterson, that is, since Peterson teaches techniques to identify locations of damage within a beam model (see paragraph 16 of final Office Action). The Examiner concludes that the motivation to combine the references as set forth in the final Office Action is proper, and not the result of impermissible hindsight.

Prima Facie Case Established

Appellant argues that "the Patent Office has not satisfied the burden of establishing a prima facie case of obviousness at least because the analysis presented in the previous Office Action has not satisfied the "all limitations" prong of the three prong test for obviousness" (page 14).

It is the Examiner's position that all claim limitations have been addressed and are supported by the prior art of record as set forth in the final Office Action and as discussed above.

The Examiner directed Appellant to the teachings of Neul who teaches the analysis of mechanical components that gives an accurate description of the static and dynamic behavior of linear spatial beams as well as more complex configurations for those beams (Conclusion), and to the teachings of Peterson who teaches a technique using experimental modal analysis and a damage localization algorithm of a structure that can identify the location of even small magnitudes of simulated damage within a beam model (Conclusions, sentences 1-2). It is the Examiner's position that these passages referred to in Neul and Peterson provide a clear and adequate suggestion or motivation to combine the teachings of Kodama, Neul and Peterson.

Further, the Examiner pointed out that Kodama, Neul and Peterson are also considered analogous since they are all directed to the modeling of a mechanical component through the use of a beam model, therefore, a reasonable expectation of success would be present in the combination of the teachings.

The Examiner concludes that a prima facie case of obviousness has been established and the rejection is proper.

Appellant argues that the combination of Kodama, Neul and Peterson do not render claim 4 obviousness at least for the reasons discussed above with respect to this feature (page 14).

It is the Examiner's position that the combination of Kodama, Neul and Peterson teach or suggest the limitations of claim 4 as recited in the final Office Action, and as further discussed above.

Applicant argues that claims 5, 7, and 8 are patentable for at least the reasons discussed with respect to claim 1 and that all dependent claims are patentable by virtue of their dependency (page 14).

It is the Examiner's position that the combinations of Kodama, Neul and Peterson teach or suggest the claim limitations of claims 5, 7, 8 and the dependent claims as set forth in the final Office Action, and as further discussed above.

For the above reasons, it is believed that the rejections should be sustained.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

Respectfully submitted,

Mary C. Jacob

Mary C. Jacob

Examiner, Art Unit 2123

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